June 20, 1939. H. C. LOUDENBECK 2,163,401

SAFETY PLUG

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Fig. 1

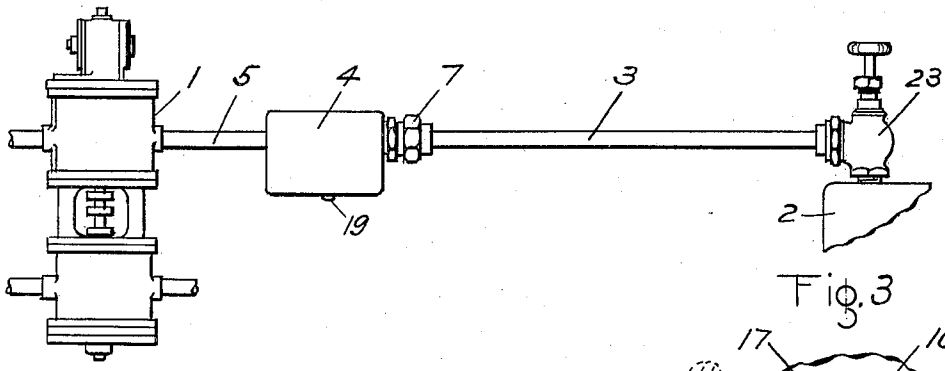


Fig. 3

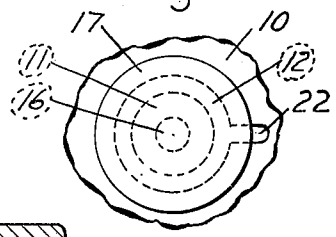
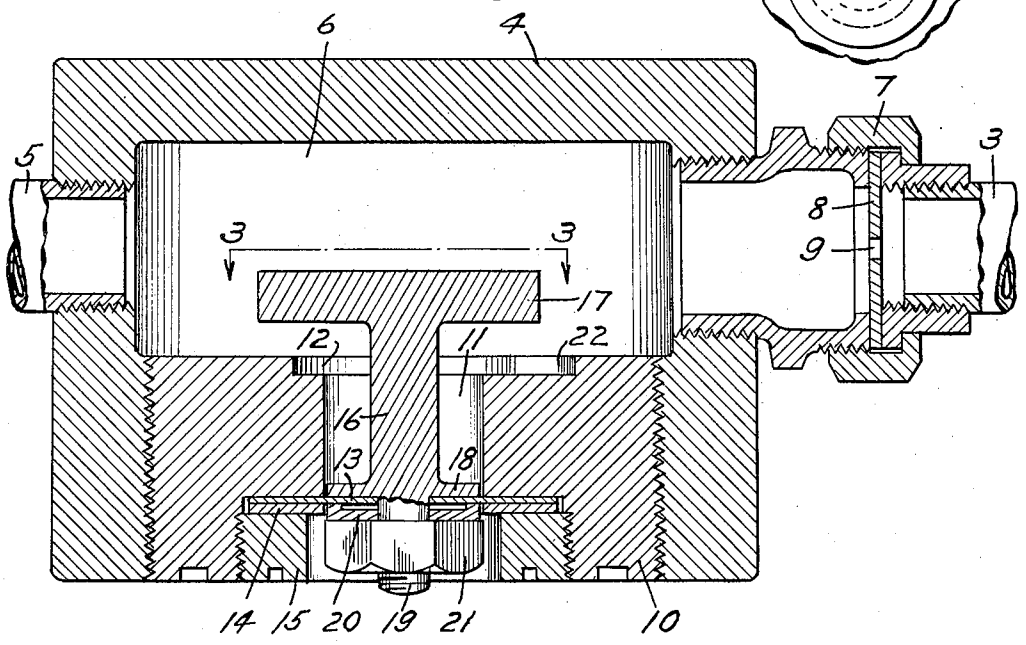


Fig. 2



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SAFETY PLUG

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2 Claims. (Cl. 137—111)

This invention relates to safety or protective devices particularly adapted for use in connection with steam driven fluid compressors.

On steam locomotives one or more steam driven fluid compressors are provided for the purpose of maintaining a supply of fluid under pressure for use in controlling fluid pressure brakes or the like.

The usual steam driven fluid compressors are not designed with a sufficient factor of safety to be operated directly by the high steam pressure employed on some locomotives, and consequently, in such installations it is customary to provide a choke between the steam supply and the compressor of such size as to limit the pressure of the steam acting at the compressor to a safe degree when the compressor is operating.

There is a possibility that a steam driven fluid compressor may fail to start or may stall after starting, in which case the pressure of the steam acting at the compressor may equalize through the choke with the high supply pressure and cause damage to the compressor, and the principal object of the invention is to provide improved means for limiting to a safe degree the pressure of steam which will be obtained at the compressor through the choke in the supply line in case the compressor fails to start or stalls after starting as above described.

In the accompanying drawing; Fig. 1 is a diagrammatic, outline view, of a simple steam driven fluid compressor installation embodying the invention; Fig. 2 is a vertical sectional view, of the protective device shown in side elevation in Fig. 1 and embodying the invention; and Fig. 3 is a view at reduced scale taken on line 3—3 in Fig. 2.

As shown in the drawing, a steam driven fluid compressor 1 is provided which is adapted to be operated by steam supplied from the usual steam turret 2 on a locomotive through a pipe 3, a device 4 and a pipe 5.

The device 4, which embodies the invention, comprises a casing having a chamber 6 open at one end to pipe 5 and at the other end to a union 7 through which communication is established to the pipe 3. A plate 8 is provided in the union 7 and has a central aperture or choke 9 for restricting the flow of steam from the turret 2 to the compressor 1 so that when the compressor is operating, the pressure of steam at the compressor will be lower than at the turret and safe for use in the compressor.

A removable plug 10 forms a portion of one side wall of chamber 6 being secured to the casing of the device 4 by screw threaded engagement.

The plug 10 is provided with an axial bore 11 terminating at one end in an annular recess 12 formed in the inner face of said plug and open to chamber 6. The bore 11 terminates at the opposite end in an annular recess formed in the outer face of the plug 10 and containing a disc shaped shear plate 13 clamped against the bottom wall of said recess by a rigid shear ring 14 engaging said plate and a clamping ring 15 having screw threaded engagement with the side wall of the recess and engaging the shear ring 14. The shear ring 14 has a central aperture of substantially the same diameter as bore 11 and in axial alignment therewith. The shear plate 13 is preferably made of relatively thin sheet metal having a predetermined resistance to shear.

A safety bolt 16 is disposed within the bore 11 and normally projects into chamber 6 wherein said bolt is provided with a head preferably in the form of a disc 17 of greater diameter than recess 12. The bolt 16 is provided with a rigid annular shear collar 18 slightly smaller in diameter than bore 11 and secured against the inner face of the shear plate 13. The bolt has a screw threaded portion 19 extending through a central opening in the shear plate 13 and mounted over said portion and engaging the outer face of said shear plate is a clamping ring 20 of substantially the same diameter as the shear collar 18. A nut 21 is provided on the screw threaded portion 19 of the bolt 16 clamping said bolt to the shear plate 13 between the collar 18 and ring 20. The clamping ring 20 is relieved centrally in the face engaging the shear plate 13 so as to obtain tight clamping engagement of said plate between the edges of the collar 18 and ring 20.

It will be noted that the shear collar 18 and shear ring 14 are arranged in shearing relation to each other on opposite sides of the shear plate 13 and that the pressure of steam supplied through chamber 6 for operating the compressor 1 acts on the shear plate 13 within the bore 11 tending to cause such shearing.

The material from which the shear plate 13 is made is so chosen, however, as to prevent shearing by the pressure of steam obtained in chamber 6 through the choke 9 when the compressor 1 is operating as intended. However, if, for any reason, such as stalling of the compressor, the pressure in chamber 6 starts to build up to a higher degree, then before the pressure in said chamber becomes increased to a degree

which might cause damage to the compressor, said pressure overcomes the resistance to shear of the shear plate 13 and causes shearing thereof by the cooperative action of shear collar 18 and ring 14. The pressure in chamber 6 acting in bore 11 on the sheared out central portion of the shear plate 13 then forces the bolt 16 outwardly to a position in which the bolt head 17 engages the inside wall of plug 10 covering the recess 12. A groove 22 is provided in the inner face of the plug 10 connecting recess 12 under the bolt head 17 to chamber 6 and after shearing of the shear plate 13, this groove permits leakage of steam from chamber 6 at such a rate with respect to the rate of supply through choke 9 as to limit to a safe degree the pressure obtained in chamber 6 and acting at the compressor 1. The action of groove 22 to limit the leakage of steam from chamber 6, provides a sufficient steam pressure in said chamber for operating the compressor, if subsequently to the shearing of the shear plate 13, said compressor starts to operate. Furthermore, if it is necessary to delay the replacement of the sheared plate 13, the steam supply to the compressor 1 may be cut off by the usual globe valve 23 at the steam turret 2 to permit the compressor to be conditioned for operation again following which the steam supply may be cut in and the compressor operated in the usual manner in spite of the leakage through groove 22.

The bolt 16 and head 17 act, in case of shearing of the shear plate 13, to prevent said plate from being blown into space with the possibility of causing damage to either person or property.

In order to replace a sheared plate 13 with a new plate, the clamping ring 15 and shear ring 14 are removed from the plug 10, and the nut 21 and clamping ring 20 are removed from the bolt extension 19. The parts of the old shear plate 13 are then removed and a new shear plate is installed and secured in position by replacing the clamping ring 20 and nut 21 on the bolt 16 and the clamping ring 15 and shear ring 14 in the plug 10.

While one illustrative embodiment of the invention has been described in detail, it is not my intention to limit its scope to that embodiment or otherwise than by the terms of the appended claims.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. The combination with a casing having a chamber adapted to be supplied with fluid under pressure, of means for limiting the pressure of fluid in said chamber comprising a plug in said casing closing an opening through one wall of said chamber and having a bore through which said chamber is adapted to be opened to the atmosphere, an element having a predetermined resistance to shear secured in said plug closing communication through said bore to the atmosphere, means for shearing said element for opening said communication if the pressure of fluid in said chamber exceeds the shear resistance of said element, said plug having in its inner face a recess normally open to said chamber and bore, and a member movable into engagement with the inner face of said plug for covering said recess upon shearing of said element, said plug having a groove of predetermined flow capacity connecting said chamber to said recess for venting fluid from said chamber when said member is in engagement with the inner face of said plug.

2. The combination with a casing having a chamber adapted to be supplied with fluid under pressure, of means for limiting the pressure of fluid in said chamber comprising a plug in said casing closing an opening through one wall of said chamber and having a bore through which said chamber is adapted to be opened to the atmosphere, an element having a predetermined resistance to shear secured in said plug closing communication through said bore to the atmosphere, means for shearing said element for opening said communication if the pressure of fluid in said chamber exceeds the shear resistance of said element, said plug having in its inner face a recess normally open to said chamber and bore, a member in said chamber secured to said element and normally spaced from the inner face of said plug, said member upon shearing of said element being movable into engagement with the inner face of said plug for preventing said element being blown into space and for covering the open end of said recess, said plug having a groove forming a communication of predetermined flow capacity between said recess and chamber by-passing said member.

HARRY C. LOUDENBECK.